

University of Manchester School of Chemistry

Procedures and Methods Sheet: 022 Correct Use of Fume Hoods

Fume hoods are well-ventilated work areas from which gases and chemical vapours are extracted through ductwork and vented outside the building. They afford vital protection for researchers against inhaled chemicals, provided they are used, cleaned and maintained correctly.

There are two main types of fume hoods in the Chemistry building. The first type is enamelled metal cabinets with metal cords to operate the sash and are on the first, second, third and most of the fifth floor of the building as well as lab 4.22. The second type is the modern CleanAir fume hoods with digital displays.

A new member to a group should be shown their fume hood and trained in its correct use. This is to be done by an experienced member of the group. Please make a note of any defects before starting and report to the Safety Office (extension 60577/ 57851) for repair.

There are specific risk assessments which cover the uses of the Fume Hood; please ensure you read and understand the control measure and mitigation for your Health and Safety when using the fume hood.

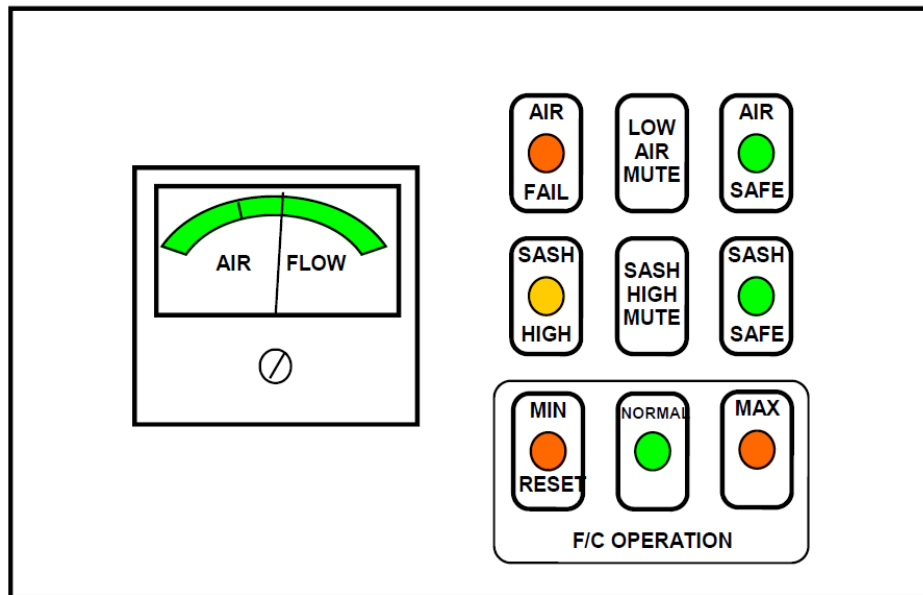
Type I



Type II



Controls Type I



METER

ANALOGUE or **DIGITAL** meter with continuous reading of **FACE VELOCITY**

AIR SAFE AIR FAIL ALARM

GREEN LED
RED LED (Flashing)
Audible alarm with MUTE push button

SASH HIGH SASH SAFE ALARM

AMBER LED (Plain / Flashing)
GREEN LED
Audible alarm with TIMED MUTE button

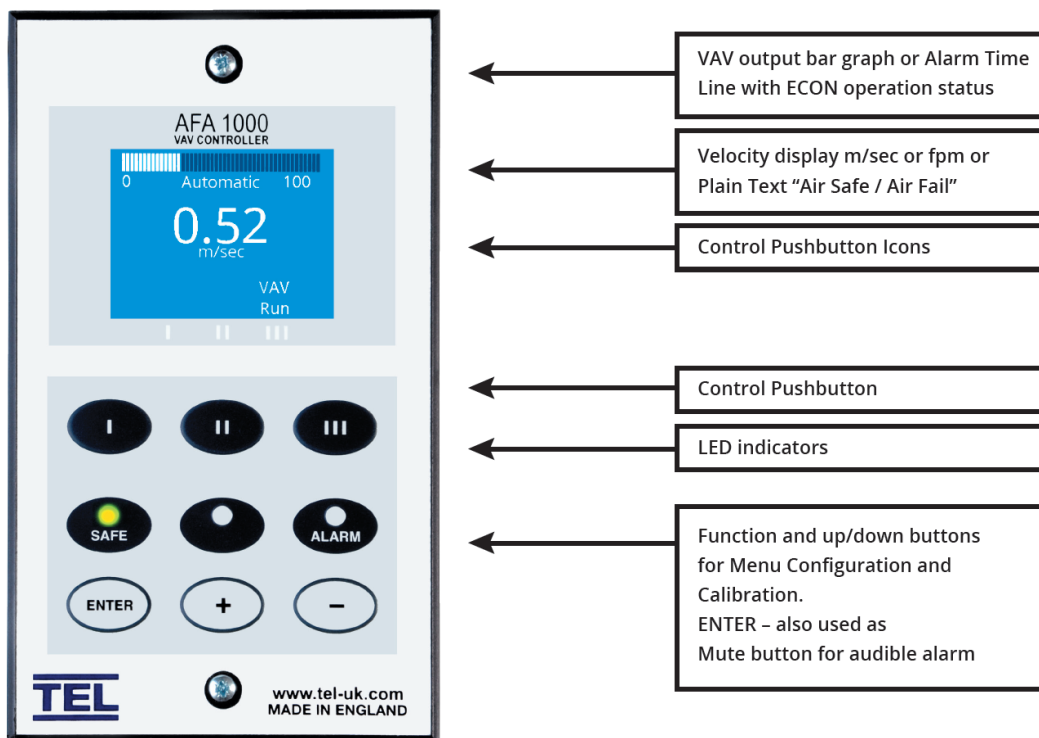
MIN / RESET NORMAL MAX

RED Illuminated Pushbutton
GREEN Illuminated Pushbutton
RED Illuminated LED

Purge on light- on all type I hoods can only be cancelled by switching fume hood off and on again

Firetrace indicator- not shown, but a small circular gauge coloured red/green with a needle.

Controls Type II



Sash High – when the sash is raised above the max safe working opening.

Air Fail – if the airflow is less than the air flow point (below 0.4 m/s).

Emergency – if the emergency input is activated or if **MAX** or **PURGE** pushbuttons are pressed.

Mute Icon – whenever the audible alarm is muted.

Pushbutton I – can switch the fume hood **ON** and **OFF**.

Pushbutton III – can turn **PURGE ON/OFF** and sets running in **MIN, MAX** and **RUN** modes. Purge can be used for short periods of high hazard, e.g. dispensing silica gel, spillage etc.

When an alarm is sounding pressing **ENTER** will mute the alarm.

Fault Reporting

If your fume hood is alarming due to an air fail, or you find another critical fault with the hood which affects its ability to protect you from hazardous substances, please email the Health and Safety Office at HealthandSafetyOffice@manchester.ac.uk and cease to use the fume hood until advised that it has been repaired and therefore, safe to use.

In the email, please include:

The University of Manchester

- Subject must include "Fume hood fault."
- Your research group
- Laboratory number
- Fume hood number
- A brief description of the fault

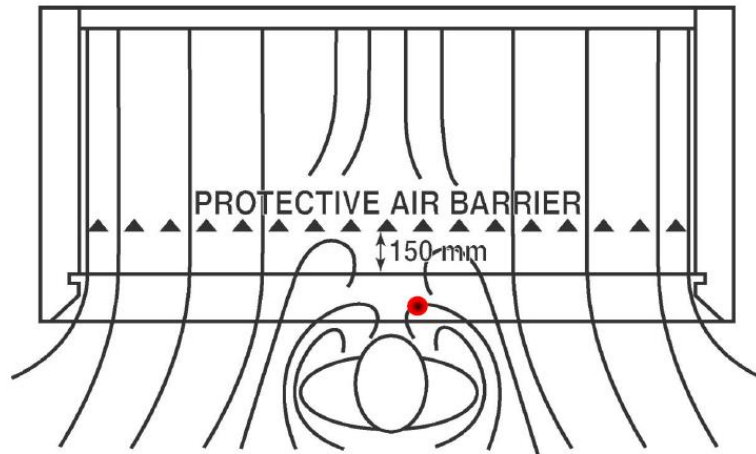
Note: please CC your supervisor in this email to keep them informed.

The Do's and Don'ts of Fume hood use.

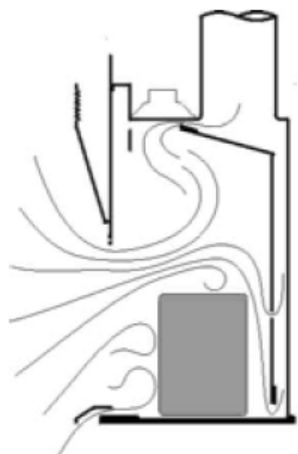
Do:

- 1) Work with the fume hood sash as low as possible and leave the sash fully closed when the fume hood is unattended.
- 2) Ensure the fume hood extraction has been tested within the last 14 months and it is suitable for the work that you intend to carry out – this information should be on a blue Allianz Sticker on the front of the fume hood. Please contact the Safety Office at 60577/ 57851 to arrange a test if needed.
- 3) Check that the fume hoods are working – hoods have a visual airflow gauge and an audible alarm which lights up on the control panel to signal low flow. A tell-tale (a piece of tissue) could also be used here for additional reassurance.
- 4) Ensure the fume hood is clean and uncluttered – remove equipment when it is not in use.
- 5) Check the status of the Firetrace system (automatic powder extinguishing system) if installed, on a weekly basis. Advise the Safety Office (extension 60577/ 57851) if the needle on the gauge is borderline green/red or in the red. Please also advise if the gauge is showing movement towards the red. The information required is your name, the laboratory number and the affected fume hood number.
- 6) Ensure the appropriate documentation for the processes going on in the fume hood is available (Chemical Risk Assessments, overnight forms etc.)
- 7) Be aware of other peoples working patterns – there is only a 66% diversity of the fume hoods – i.e. they are designed such that there is just enough capacity in the ductwork for 2/3 of the fume hood sashes to be open at any one time to provide safe working conditions for all. This ratio is very specific, such that out of any bank of three fume hoods, only two should have the sash raised at any one time. This is why point 1 is extremely important!

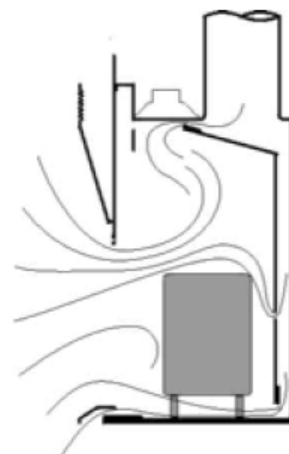
- 8) Clear up any spillages.
- 9) Keep the fume hood tidy and remove all equipment and chemicals that are not being used.
- 10) Keep all equipment and samples at least 150mm inside the fume hood.



- 11) Having large equipment in the fume can disrupt the air flows. Ensure that there is a 50mm gap underneath and around the item to allow sufficient airflow and protection.



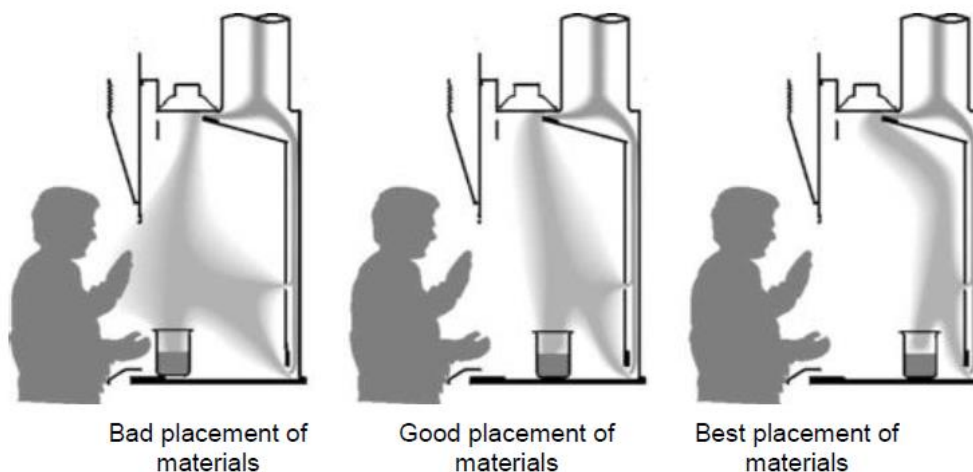
Poor placement of large equipment



Good placement of large equipment

Do Not:

- 1) Hang lab coats etc. on the taps on the front of the fume hood – this impedes the air flow of the fume hood so it does not extract efficiently and may also pull the tap heads away from the fume hood.
- 2) Store solvents and other chemicals in hoods used for synthesis – there are special ventilated cabinets provided for this purpose. If the hoods are used for collecting waste solvents etc., keep the receiving containers lightly capped unless they are being filled.
- 3) Put bags of dry ice directly onto bases of the fume hoods – this subjects the bases to thermal shock and may cause cracking.
- 4) Use the purge button in normal operation. This is only for use after a spillage to clear the fume hood quickly. Permanent use of purge means that there will be an imbalance elsewhere in the system and the health of others will be at risk!
- 5) Leave chemicals, reagent bottles TLC plates, spotters etc. on the sash – this prevents the fume hood from working efficiently and will not protect you from inhaling these chemicals.



Cleaning, Testing and Maintenance

It is the Researcher's responsibility to ensure that his/her fume hood is kept clean (a statutory requirement). Cleaning of fume hoods should be done with diluted (approx. 1:200) sodium hypochlorite solution in water (nb. check the risk assessment and ensure the appropriate protective clothing is worn).

The Safety Office is responsible for ensuring the testing of the School fume hoods within 14 months of the previous test.

Outside this inspection, any malfunction of the fume hoods (extract failure) and any services within (gases, water, drainage, cracked beds) noted by the Researcher must be reported to the Safety Office (extension 60577/ 57851) with the following information – your name, the nature of the fault, the faulty fume hood number and laboratory number.

Recirculating fume hoods are to be tested and maintained every 12 months by a trained engineer. This will include containment testing, face velocity testing and filter performance testing. They will change filters as and when needed.

Recirculatory Fume Cupboards

In the School recirculatory, fume cupboards are NOT the preferred option, particularly for work with toxic or flammable vapours or gases.

Recirculating fume cupboards rely absolutely on the absorption of the hazardous vapour or gas by a filter media, usually carbon-based, before discharging the 'cleaned air' back into the room. **When the filter media becomes saturated, as it will over time, or if it fails in any way the hazardous material will enter the room potentially without warning!**

The preferred option is always to vent fume cupboards to a safe place outside.

The filter within a recirculating fume hood must be appropriate for the chemical you are using (or may generate) at a known or anticipated concentration, **always consult the filter manufacturer as to the suitability of a particular filter medium.**

Because recirculating fume cupboards always **fail to 'danger'**, they **must not be used where failure would result in exposing users to an immediate acute threat to life or health.** Wherever possible (available for the chemicals in use) recirculating fume cupboards should be fitted with sensors to warn of pending filter failure. In the absence of such sensors, frequent filter changes are the only means of ensuring control.

Since they can fail without warning and it is not possible to predict failure, if used, they must always be on a rigorous maintenance contract (arranged by the School) and be kept under constant review.

If a recirculating fume cupboard has been identified by the risk assessment as the only practicable control measure for a particular purpose, in a particular location, **then any change of use or relocation must be subject to a further risk assessment of its suitability for use.** It must not be assumed that a dispensation to use a recirculating fume cupboard as a control measure for a particular chemical in a specific location automatically authorises uses outside of the risk assessment for that use in that location.

High-Efficiency Particulate Air (HEPA) Filtered Cabinets

High-Efficiency Particulate Air (HEPA) Filtered Cabinets remove particulate material, but NOT gases or vapours, by passing air through a HEPA filter before discharge to a safe place outside or back into the room (recirculatory). It must be emphasised that while a HEPA filter is an extremely efficient way of removing solid particles as low as 2 nm in diameter they are not in themselves absorbent and do not remove hazardous or malodorous gases or vapours. If hazardous vapours or gases are used/generated in a HEPA filtered cabinet, it must be vented to a safe place outside, as with any other fume cupboard. Also if a HEPA filtered cabinet were to be considered for both capturing particulates and handling hazardous vapours and fumes, it must be first established that the vapours and fumes would not have a deleterious effect on the HEPA filter itself or its seals.

Therefore recirculatory HEPA filtered cabinets, have a role in the control of small quantities of toxic powders during weighing and other non-energetic activities (for further guidance concerning the use of HEPA filtered cabinets with powders see the University's Nano-particle Safety Guidance See chapter 28 <http://bit.ly/2n1bnjY>)

Double HEPA filter cabinets can have the advantage of increased efficiency and potentially providing a means of changing filters while maintaining containment. Remember that running a HEPA filtered cabinet when not actually in use and storing volatile chemicals in it may shorten the operating life of the filter as it will slowly become blocked by background 'room dust' in the air and could be damaged by exposure to hazardous vapours.

Common Fume Cupboard Myths

Myth - When working with highly dangerous materials, the higher the face velocity, the better.

While it is important to have a face velocity between 0.4 – 0.6 ms⁻¹, in most fume cupboards, velocities higher than this are harmful. When face velocity exceeds 0.6 ms⁻¹ eddy currents are created which allow contaminants to be drawn out of the hood, increasing worker exposures.

Myth - The airfoil on the front of a fume cupboard is of minor importance. It can safely be removed if it interferes with my experimental apparatus.

Airfoils are critical to efficient operation of a fume cupboard. With the sash open an airfoil smooths flow over the enclosure edges. Without an airfoil eddy currents form, causing contaminants to be drawn out of the fume cupboard. With the sash closed, the opening beneath the bottom airfoil provides for a source of exhaust air.

Myth - Using a fume cupboard makes my work safe.

A fume cupboard is only part of your safety systems – remember its limitations, and appreciate that protection is being afforded mainly by nothing more than airflow which can be relatively easily disturbed.

Acknowledgement

By signing below, you acknowledge that you have read and understood the requirements for using the fume hoods within the chemistry building and agree to follow all rules and procedures set out within this document.

Date	Name	Signature	Counter Signature

Pre-Use checklist.

Before using a fume hood, it is essential that the following items are checked. This process is to ensure your and others safety.

- The area immediately around the fume hood is free of clutter and trip hazards.
- The sash moves freely and does not stick or jam in place.
- Viewed externally, the metal wires holding up the sash are in good order.
- The control panel is not damaged.
- The fume hood is switched on, and airflow is detected and sufficient for protecting you.
- The fume hood is in normal running mode (not in purge mode or minimum).
- The fume hood interior is clear of clutter and is ready for use.
- When chemistry is being carried out, no solvents should be present in the hood.
- The CRA should be signed and present.

If you are unsure whether the fume hood is extracting you can use a piece of tissue to see if it moves in the airflow.

If you are not confident that your fume hood is operating correctly, please contact the Safety Office (extension 60577/ 57851) who will come and verify the fume hood extraction.

If your fume hood fails, any one of the checks above report it to the Safety Office on extension 60577/ 57851 or email with the details of the issue and the fume hood room and number. Also, email your PI to inform them of the failure of your/ fume hood.

Checklist for training.

The following is guidance only on what types of information should be taught to new group members on the operation of their fume hood.

This list is not exhaustive, and training should be given before first use of a fume hood.

- Location and number of the fume hood
- If they share a fume hood with another group member introduce them.
- Talk them through the Pre-use checklist.
- Demonstrate the operation of the control panel.
- What services are available within the fume hood.
- Where do they store the CRA
- Are there any limitations on what can be used in the fume hood.
- Explain about the fire suppression system within the fume hood.